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3G vs. 4G – Overview

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Abstract — In the present scenario of technology 3G wireless data networks have emerged as the first high speed ,pervasive data networks while 4G wireless networks are poised to replace 3G networks as the successors of mobile data networks, but the passage will be prolonged and exorbitant. Wireless authentication across 3G and 4G data networks is typically an laborious task, requiring complete disassociation from the existing network before performing a lengthy full authentication on the new network system. 4G is a conceptual framework for a discussion point to address future needs of a universal high speed wireless network that will interface with wire with wire line backbone network seamlessly.

Keywords — packet switching , message switching , wireless network , Mobile WiMAX , LTE (Long-Term Evolution) .

I. INTRODUCTION

First of all basically , the "G" stands for a generation of mobile technology, installed in phones and on cellular networks. The first two were analog cell phones (1G) and digital phones (2G). Thereafter it got convoluted. Third-generation mobile networks, or 3G , was launched in Japan in 2001. With minimum unvarying Internet speeds of 144Kbps, 3G was supposed to bring "mobile broadband." There are now so many categories of 3G, though, that a "3G" connection can get you Internet speeds anywhere from 400Kbps to more than ten times that.Subsequent generations usually bring new base technologies and ideas , more network capacity for more data per user, and the dormant for better voice quality, too. Thus 4G phones are supposed to be even faster, but that's not always the case. Basically 4G network system provides mobile ultra-broadband Internet access.

II. BACKGROUND

3G technology was the upshot of research and development dept. of International Telecommunication Union (ITU) in the early 1980's. The specifications and standards of 3G were refined within fifteen years. The technical specifications were made available to the public under the name IMT-2000. The communication spectrum allotted to 3G network system ranges between 400 MHz to 3 GHz. The first pre-commercial 3G network was launched by NTT DoCoMo in Japan in 1998, branded as FOMA. It was first made available in May 2001 as a pre-release (test) of W-CDMA technology. The first commercial launch of 3G was also by NTT DoCoMo in Japan on 1 October 2001, although at starting it was significantly limited in scope , broader availability of the system was deferred by apparent concerns over its reliability. Both the government and communication association sanctioned the 3G standard for further amelioration. Later on 3G releases sub-categories, often denoted as 3.5G and 3.75G , also provided mobile broadband access of several Mbit/s to smartphone and mobile modems in laptop computers. In 2001, by 3G multi-media support, spread spectrum transmission and at least 200 kbit/s peak bit rate was achieved , while it was expected to be followed by "real" 4G network arrangement by 2010/2011, which would refers to all- Internet Protocol (IP) packet switched networks giving mobile ultra-broadband (gigabit speed) access. In 2008, ITU-R specified the ITU-Advanced (International Mobile Telecommunications Advanced) requirements for 4G systems.

The fastest 3G-based standard in the UMTS family is the HSPA+ standard, which was commercially available since 2009 and offers 28 Mbit/s downstream (22 Mbit/s upstream) without MIMO, i.e. with the application of only one antenna, and in 2011 it was accelerated upto 42 Mbit/s peak bit rate downstream using either HSPA+ (simultaneous use of two 5 MHz UMTS carrier) or 2x2 MIMO. Theoretically speeds up to 672 Mbit/s is possible, but has not been utilized yet. The fastest 3G-based standard in the CDMA-2000 family is the

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EV-DO Rev.B, which is available since 2010 and offers 15.67 Mbit/s downstream.

III. THE DISPARITIES

RF	3G	4G
Backhaul	Circuit-Switched	Software-Switched
Packet Transport	IPv4	IPv6
Peak Upload Rate	5 Mbps	500 Mbps
Peak Download Rate	100 Mbps	1 Gbps
Radio Technology	Hardware	Software-Defined
Data Throughput	Upto 3.1 Mbps with an average speed ranging from 0.5 to 1.5 Mbps	Virtually 2 to 12 Mbps but potentially it ranges between 100 to 300 Mbps
Revenue	Voice-Dominant	Data-Dominant
Service Architecture	Network Attached	Cloud-Based
Macrocells	Macrocells	Macro , Pico , Femto
Frequency Band	1.8 – 2.5 GHz	2 – 8 GHz
Network Operations	Internal	Outsourced
Forward Error Correction (FEC) :	3G uses Turbo codes for error correction	Concatenated codes are used for error correction
Service Delivery	Walled Garden	Hosted , OTT , Partners
Services & Applications	CDMA 2000 , UMTS , EDGE etc	Wimax2 and LTE-Advance

When to opt for 3G network system :-

- When an user's location is out of coverage area from 4G network system :- If an user doesn't have the network access , there's no point in buying a 4G phone , since it wouldn't be able to communicate with any 4G cell towers to relay the signal. Due to this cause , most of 4G phones are backward compatible i.e. they can still connect to 3G towers when a 4G network isn't available.
- Sometimes an user might not really use a lot of data-hungry applications :- If an user don't plan to access streaming lots of music and video from the web , then most probably he wouldn't require the blazing fast speeds offered by 4G. Most of the apps work smoothly even with 3G network system for instance – GPS , Email and social networking etc.

When to opt for 4G network system :-

- If an user's carrier has solid 4G network coverage area :- if the network is available within the vicinity of user , then user must utilize the advantages of 4G network system.
- If an user uses lots of data and streaming :- If an user like to watch YouTube on his way to work , 4G network would be best as it has blazing fast speed which could be insanely useful , however data pack usually cost the same amount regardless of whether they're on 3G or 4G.

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IV. Distinction between 3G an 4G across mobile activities…

Perspective	3G	4G
Downloading a game (20 MB)	3 minutes	25 seconds
Streaming Music	10 second buffer possible disruption during playback	1 second buffer time
Streaming SD Video	20 second buffer possible disruption during playback	1 second buffer time
Streaming HD Video	1-5 minute buffer disruption during playback	30 second buffer time
Uploading an Image	25 seconds	1 second

V. Conclusions

Both the network system 3G as well as 4G have a great deal to offers in terms of speed and quality , although the speed of the 3G and 4G networks depends on cell towers and bandwidth of the towers. 3G provides more security mechanism while 4G is an important trend in it , which includes lots of issues as seamless connection , high mobility and secure services.

4G technology is expected to catch on and become the foremost connectivity provider in the upcoming years.

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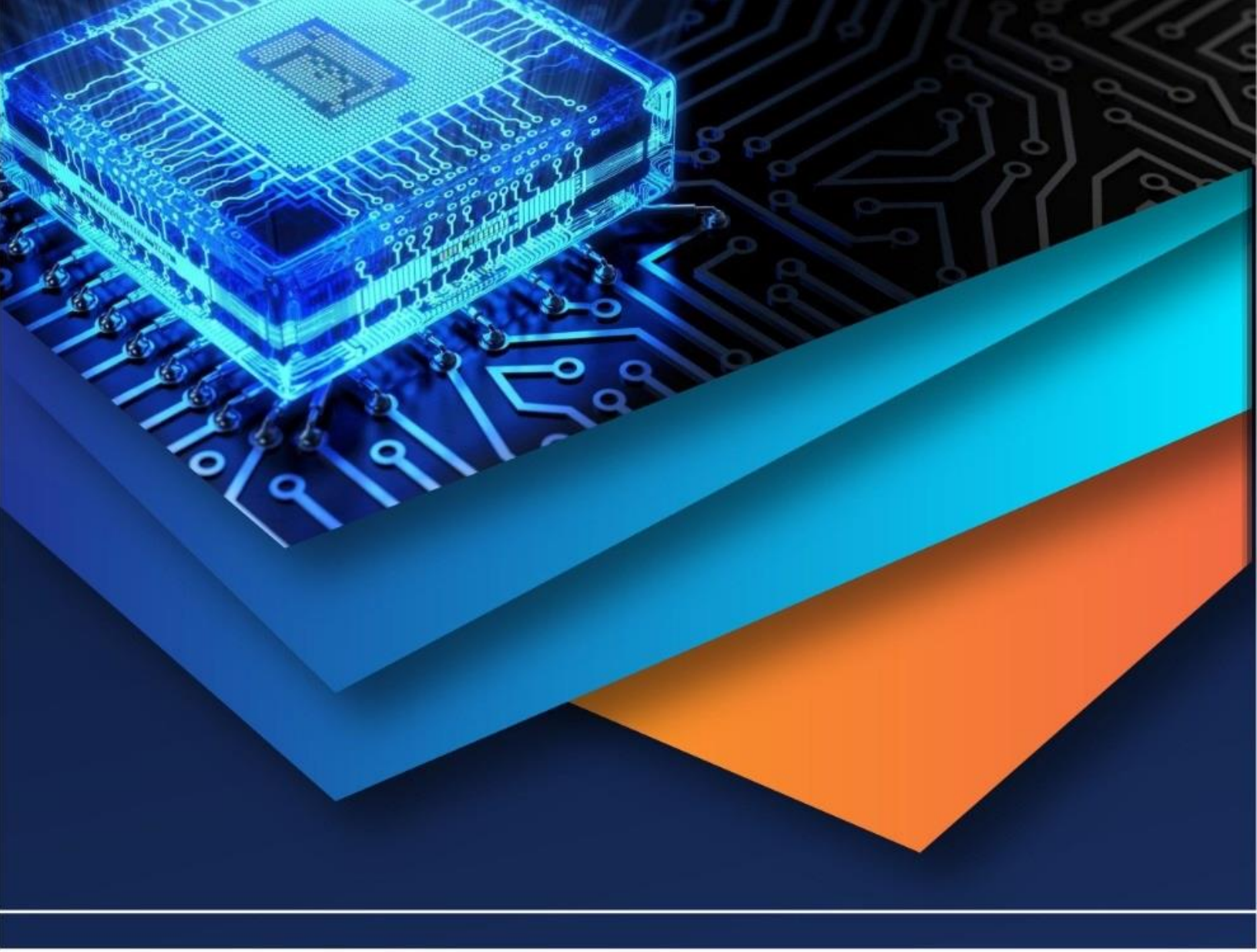
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